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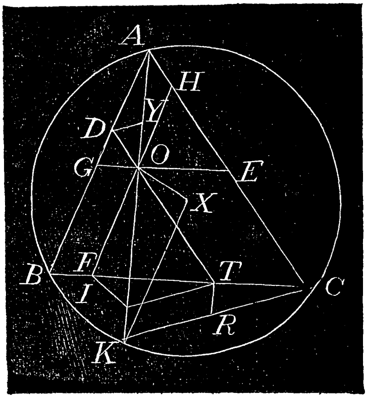
166. "If through a point O, within a given triangle ABC, three lines be drawn respectively parallel to the sides of the triangle; viz., GE parallel to BC, FH, to AB and DT to AC, and there is given, $GO \times OE + FO \times OH + DO \times OT$; to find the locus of O by plane geometry."

SOLUTION BY PROF. W. P. CASEY, SAN FRANCISCO, CAL.



Construction. Let X be the centre of the circle circumscribing the triangle ABC. Join AO and produce it to K, draw TR parallel to OK, and TI parallel to CK. Join IF; and make the angle $ADY =$ angle OIF.

Demonstration. It is evident that a circle will circumscribe the quadrilateral OF IT, and that the triangles GOA and TRC are similar; also, the triangles ODY and OIT are similar. Hence we have $GO \times TC = AO \times TR$, or $GO \times OE = AO \times IK$ (1); and from the similar triangles ADY and OIF we have $AD \times OF = AY \times OI$, and therefore $HO \times OF = AY \times OI$ (2); and from the similar triangles ODY and OIT we have $DO \times OT = OY \times OI$ (3). By adding equations (1), (2) and (3) we get $GO \times OE + HO \times OF + DO \times OT = AO \times IK + AY \times OI + OY \times OI = AO \times IK + AO \times OI = AO \times OK = (XK)^2 - (XO)^2 =$ a given quantity.

[Solutions of the remaining problems in No. 3 will be published in No. 5, as follows: 167, by Prof. C. M. Woodward; 168, by Prof. H. T. Eddy; 169, by Chas. H. Kummell.–No answers to Queries in No. 3 have been rec'd.]

PROBLEMS.

160. (SELECTED) BY G. W. HILL. — Given the lengths of the eight edges of a quadrangular pyramid to find its altitude.

161. BY O. H. MERRILL, SOUTH RUTLAND, N. Y. — A pail in the form of a frustrum of a cone—radius of upper base $2r$, of lower base r, and height h—is inclined so that if water be poured in to it, the water will just reach the lower edge of the upper base, and the upper edge of the lower base. How many gallons of water in the pail?

162. BY ARTEMAS MARTIN, ERIE, PA. — Find the least integral values of x and y that will satisfy the equation $x^2 - 9817y^2 = 1$.

163. By E. B. Seitz, Greenville, Ohio.—A Given semicircle is divided into two quadrants, and a point is taken at random in each quadrant; find the chance that the distance between them is less than the radius of the semicircle.

164. By Chas. H. Kummell, Detroit, Mich.— Give the most convenient method to compute $\Gamma(\frac{1}{6}n)$, n being an integer.

Query. By Marcus Bakek, Washington, D. C.— In The treatise on the elements of Geometry by Rouche′ and Comberoucse, some miscellaneous problems in solid geometry are proposed, among which is the following:—Draw a sphere which shall cut five other spheres under equal angles. Can any reader of the Analyst refer me to a solution, or if not, give one.

NOTICES OF PUBLICATIONS RECEIVED.

On Eight Meteoric Fireballs seen in the United States from July, 1876, *to February*, 1877. By Daniel Kirkwood, LL. D., Professor of Mathematics in Indiana University, Bloomington Indiana. (Read before the American Philosophical Society, March 16, 1877.)

On the Relative Ages of the Sun and certain of the Fixed Stars. By Professor Daniel Kirkwood, of Indiana University. (Read before the American Philosophical Society, April 6, 1877.)

Trilinear Coordinates; being No. II, of *Mathematical Tracts Relating to the Modern Higher Mathematics.* By Rev. W. J. Wright, Ph. D., Member of the London Philosophical Society. London: C. F. Hodgson and son, Gough square, Fleet street. 1877. This is an 8vo pamphlet of 77 pages, and is devoted, mainly, as its title imports, to illustrations of the various applications of the Trilinear System of Coordinates. —It would be difficult to present, in the same space, a clearer discussion of the subjects treated; and, besides, the publishers have contributed to the value of the book by the use of good paper and a faultless typography.

Tables of the Satellites of Jupiter. By D. P. Todd, B. A. Published for the American Ephemeris and Nautical Almanac, by authority of the Secretary of the Navy. Washington: Bureau of Navigation. 1876. 40 pages. 4to.

On the Part of the Motion of the Lunar Perigee which is a Function of the mean motions of the Sun and Moon. By G. W. Hill, Ph. D. 4to. 28 pp. Cambridge. 1877.

The rate of motion of the Lunar Perigee can be expanded in a series of ascending powers and products of the squares of the following quantities;— the lunar and solar excentricities, the lunar inclination and the ratio of the solar to the lunar parallax. The object of the author is to compute, with very great exactitude, (15 decimals are used), the first term of this series. By means of an integral, discovered by Jacobi, and of a particular solution, apparently due to the author, the question is reduced from depending on a linear differential equation of the 4th order to one of the 2nd. The treatment of the latter in § III of the memoir is extremely novel and well adapted to the end in view. But the method pursued demands the previous determination of the lunar inequalities having the argument of the variation. For this the author refers us to a yet unpublished memoir to which the present paper is properly the sequel. On this account much of the paper will, with difficulty, be intelligible, except to those having considerable familiarity with the lunar theory. For this reason, the author should not delay to give us the remaining portion of his researches.